

Stephen Turner Inc.



RISD INTAR Studio March 2014

Sustainability and Buildings: **Shades of Green**

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Stephen Turner Inc.

- Building commissioning
- Energy conservation
- Sustainability

Consulting services for better building performance

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Sylvain Turner Inc.
Building Better Performance



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FEATURED PROJECTS



[Athletic Facilities](#)
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Commissioning-Related Professional Contributions

- Teaching at U. of Wisconsin, RISD
- Industry standards committees
- RI State building code boards
- Papers & articles in ASHRAE Journal, others on commissioning, thermal comfort, high performance buildings



Sustainability in buildings... Where we were

- Previously, architect as master builder of low energy structures
 - 19th century
- More recently, large teams of specialists & sub-consultants
 - 20th century
- Resource intensive buildings with High energy use
 - More efficient buildings with poor Indoor Environmental Quality (IEQ)

Sustainability in buildings... Where we are

- Large project teams
- Less unsustainable buildings
 - Small, passive projects
 - Larger projects with new technologies to reduce energy intensity
- Evolving project delivery methods
 - Design/Build
- Centralized energy infrastructure
 - Electric grid
 - Gas pipelines
 - Fossil fuel distribution

Sustainability in buildings... Where we're headed

- Large teams
- Sustainable buildings
- Regenerative & restorative buildings
 - Improved local ecosystems
- New project delivery models
 - Design/Build
 - Integrated project delivery
 - LEAN project teams
- Microgrids, site & community level energy generation

Ideas that appeal to me

- Reyner Bantham: *The Architecture of the Well-Tempered Environment*
 - The idea that architecture belongs in one place and engineering in another is a recent one and its affect on architecture, which ought to be the most complete of the arts, has been crippling.
- Stewart Brand: *How Buildings Learn, What Happens After They're Built*
 - Contingency scenario planning
- Anonymous
 - Buildings are for people
- Maslow
 - Hierarchy of needs
- Amory Lovins
 - “The Idea Basket”
- Evidence-based engineering & design



Energy Use in Buildings

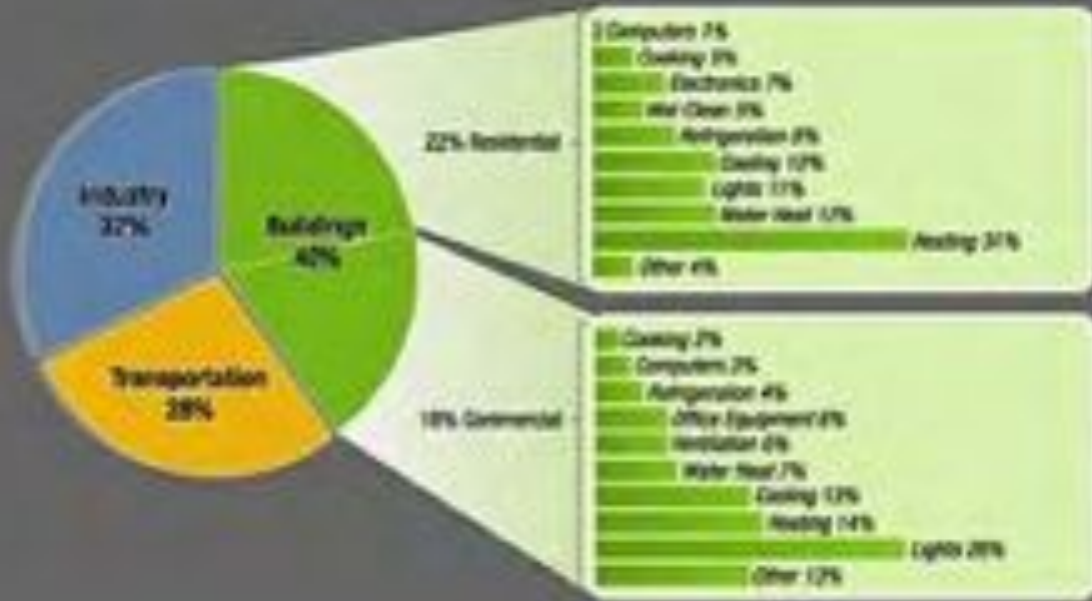
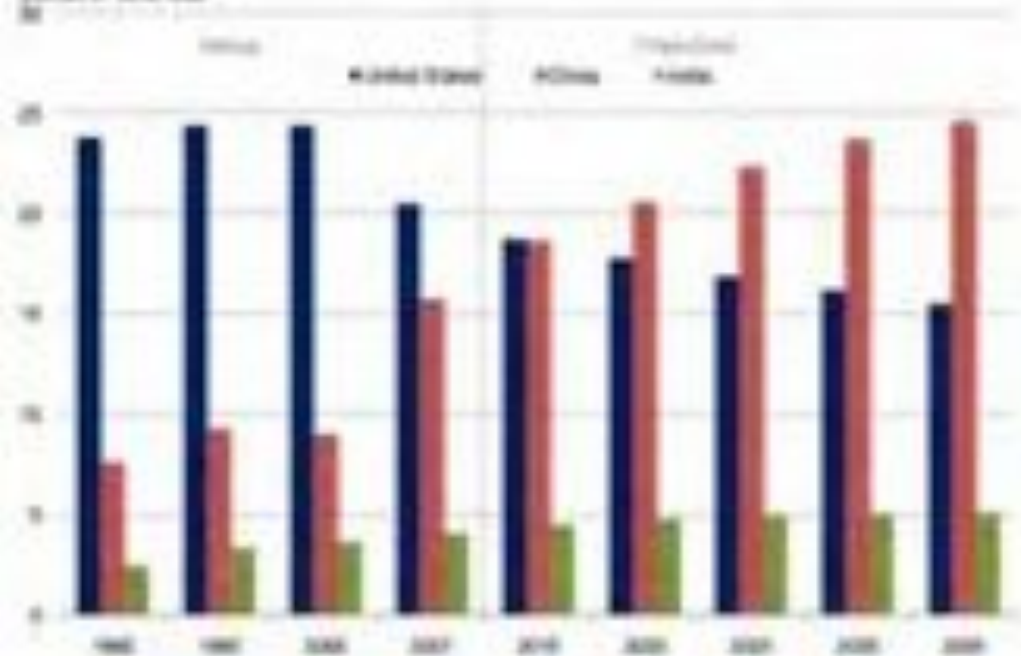


Figure 16) Shares of world energy consumption in the United States, China, and India, 1990-2009 (percent of world total)



LEED Platinum Academic Building
New Haven, CT



Project Description

Details:

- 3 Floors above ground
- Basement partially below grade
- Sub-basement “Service Node”
- Floor Area = 60,000 ft²
- Three Classrooms
- 175-seat Auditorium
- Environment Center
- Learning Center
- Library
- Office space for more than 50 faculty and staff members



Completed December 2008



Project Description

Sustainable Design Features:

- Geothermal ground source heat exchangers
- Water-side Heat Pumps
- Air Handling Units with 2-Stage heat recovery
- Indirect Evaporative Cooling capability
- Underfloor Air Distribution System
- Solar Thermal Panels for DHW
- Photovoltaic Panels
- Rainwater recapture for toilet flushing
- Waterless Urinals
- Natural daylight/Lighting controls
- Operable Windows
- Green screens In lobbies



PV Support Installation







UFAD System Details



Under Floor Air Distribution System

UFAD System Details



FloorBefore



After Floor









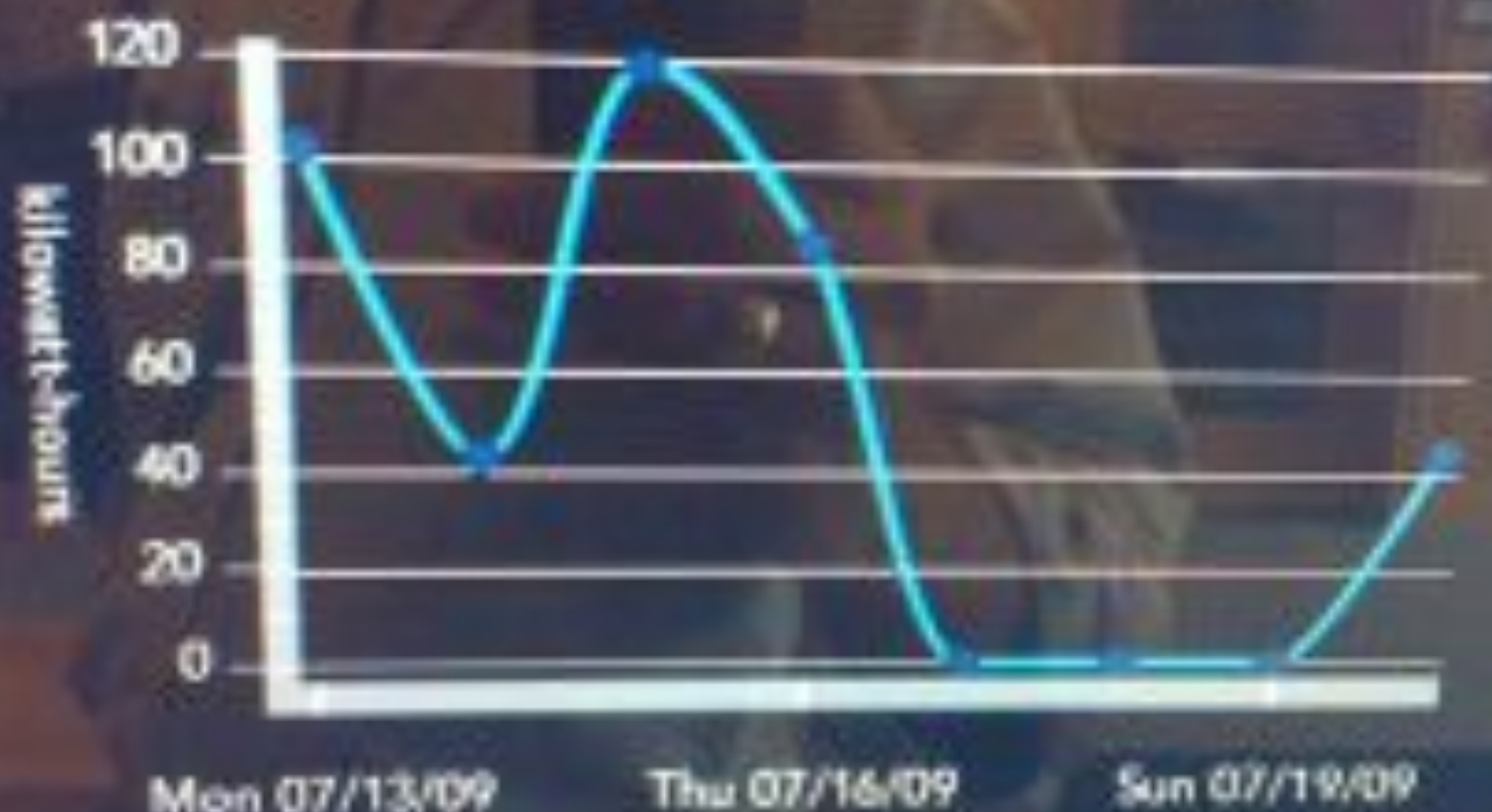


Light admitting PV panels in skylights





Photovoltaic (PV) Production



● Kroon Hall

WELCOME TO KROON HALL

Live Usage



Historical Data

- Overall Summary
- Month to Date
- Year to Date
- Q1 Summary
- Q2 Summary
- Q3 Summary
- Q4 Summary
- Rollback View
- Full View

Overall Electricity



Applications



View all the applications available for your building. You can view the details of each application and see the status of each application. You can also view the details of each application and see the status of each application.

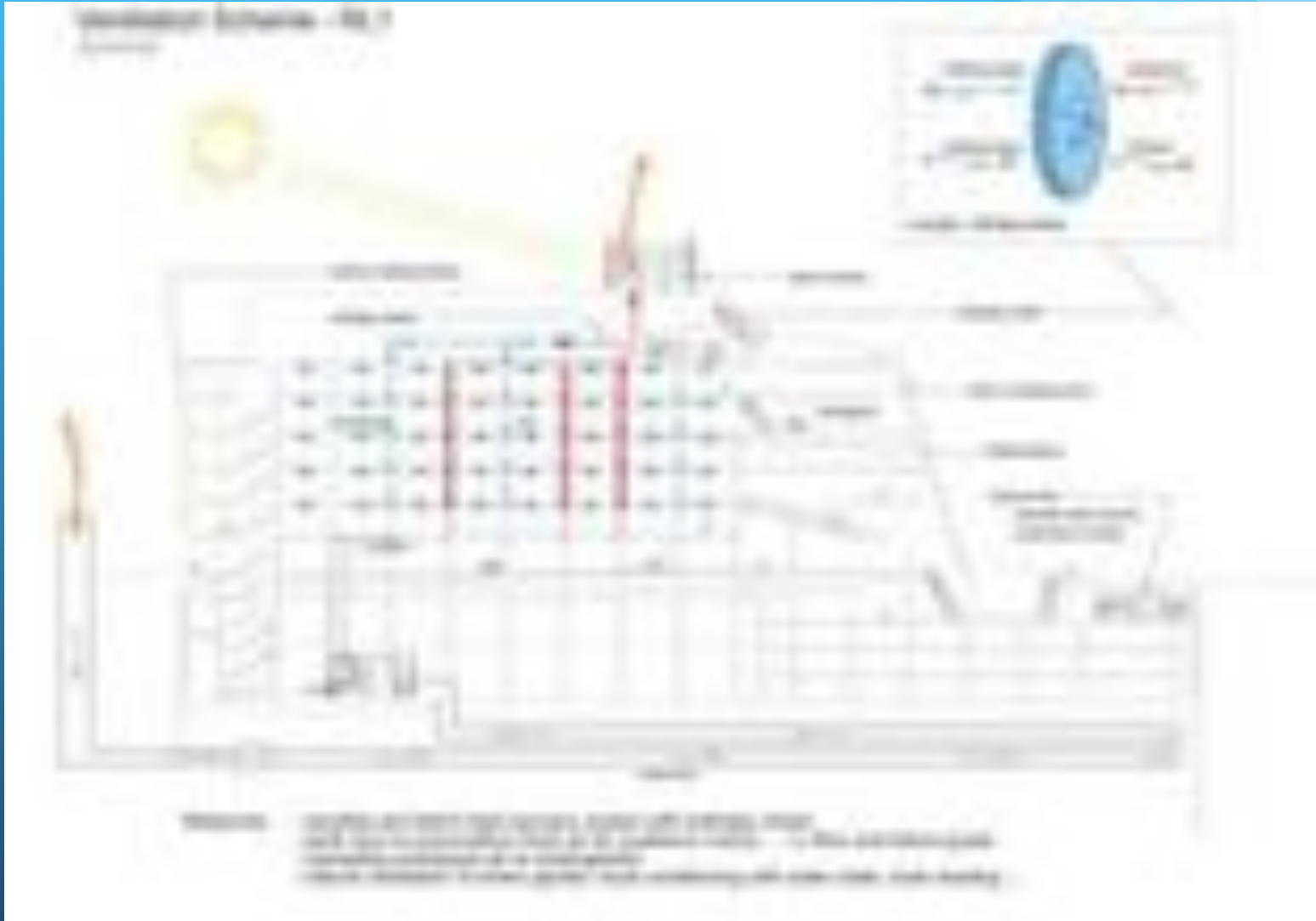
View More



Harvard University Allston First Science Complex

- One million gross square feet (gsf)
 - Half below grade
 - New central campus plant
 - Research spaces
 - Parking
 - Half above grade with wide range of space types
 - Wet labs
 - Wintergardens, atria & pedestrian bridges
 - Others, from fitness center to food service to child care

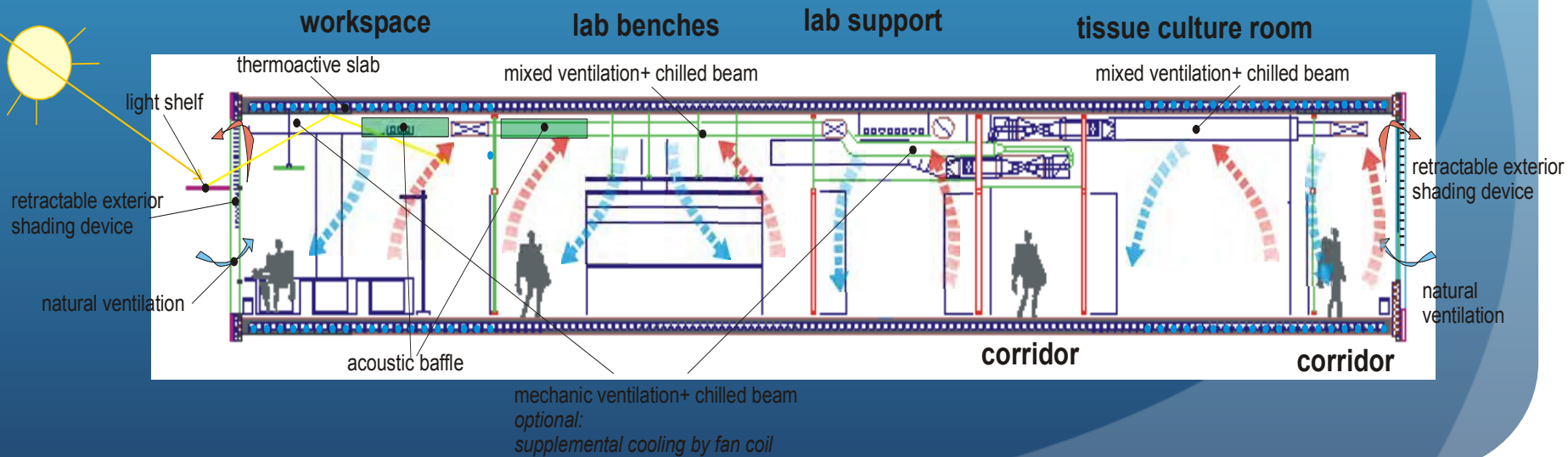
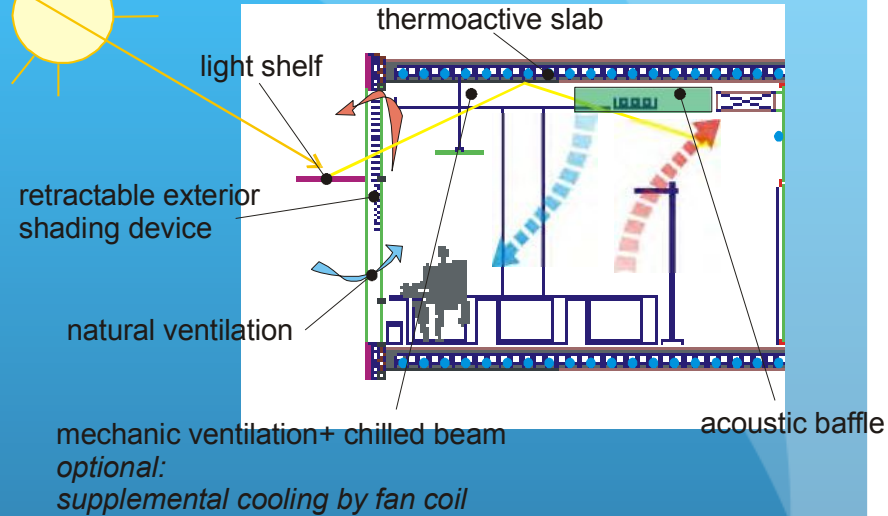
Mechanical ventilation Basis Of Design (BOD)



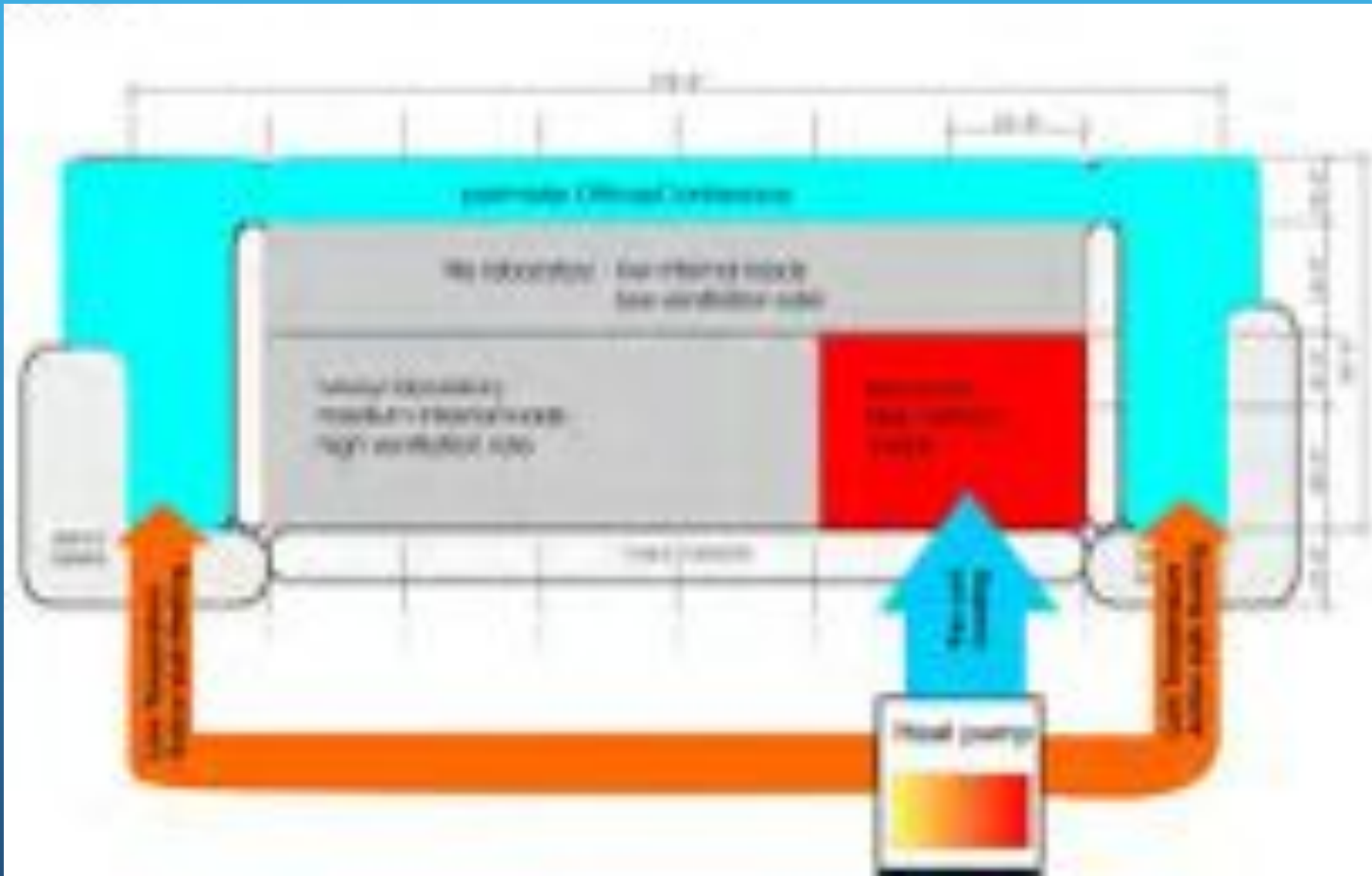
Mechanical systems



workspace



Energy shifting with heat pumps



Winter
Operation

Active slab



Large High Performance Buildings: Building Systems

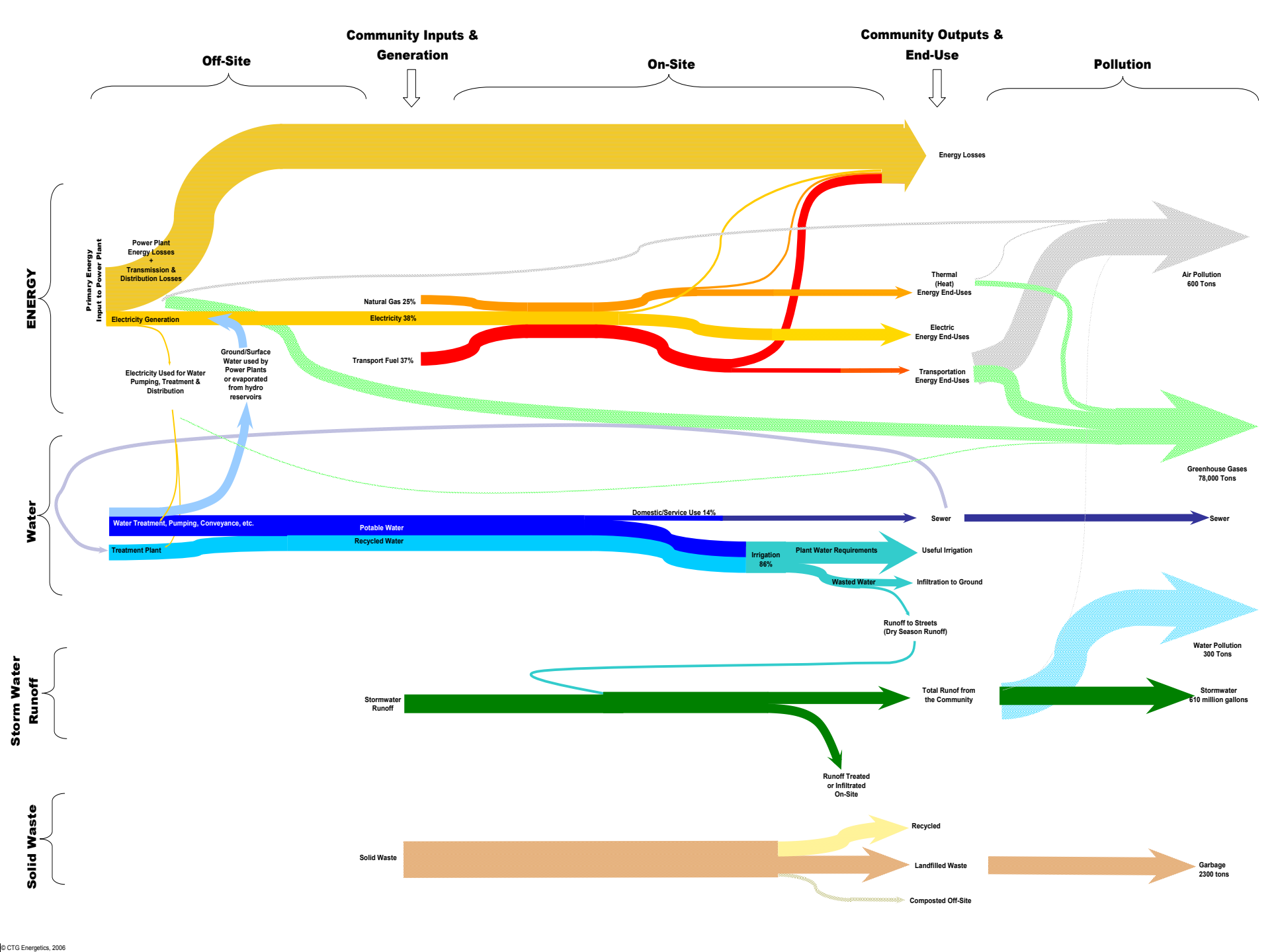
- Technology intensive
- Require trade-offs to determine where investment is best made in performance improvements
- Project teams that are limited to first cost thinking make poor Life Cycle Cost decisions
- Envelope performance determines the required building systems design responses
 - Up to a point, envelope investments are the highest value improvements

Project wide perspectives

- All design decisions are interactive
- Trade-off decisions are constantly being made, consciously or unconsciously
- New designers bring new energy and fresh approaches
- Old designers have instinctive framework within which to work
- Good design melds new solutions with sound frameworks
- Green building rating systems and integrated design approaches try to provide new frameworks to foster individual and collective experience instincts

Shades of green

- Green washing
- Modest green intent with unsustainable outcome
- Green commitment with less unsustainable outcome
- Green commitment, better implemented, with much less unsustainable outcome
 - This is what the industry thinks of as a highly sustainable or very green building today
- Regenerative or restorative commitment fully implemented
 - A building that contributes to the health of some larger ecosystem defined beyond the confines of the building

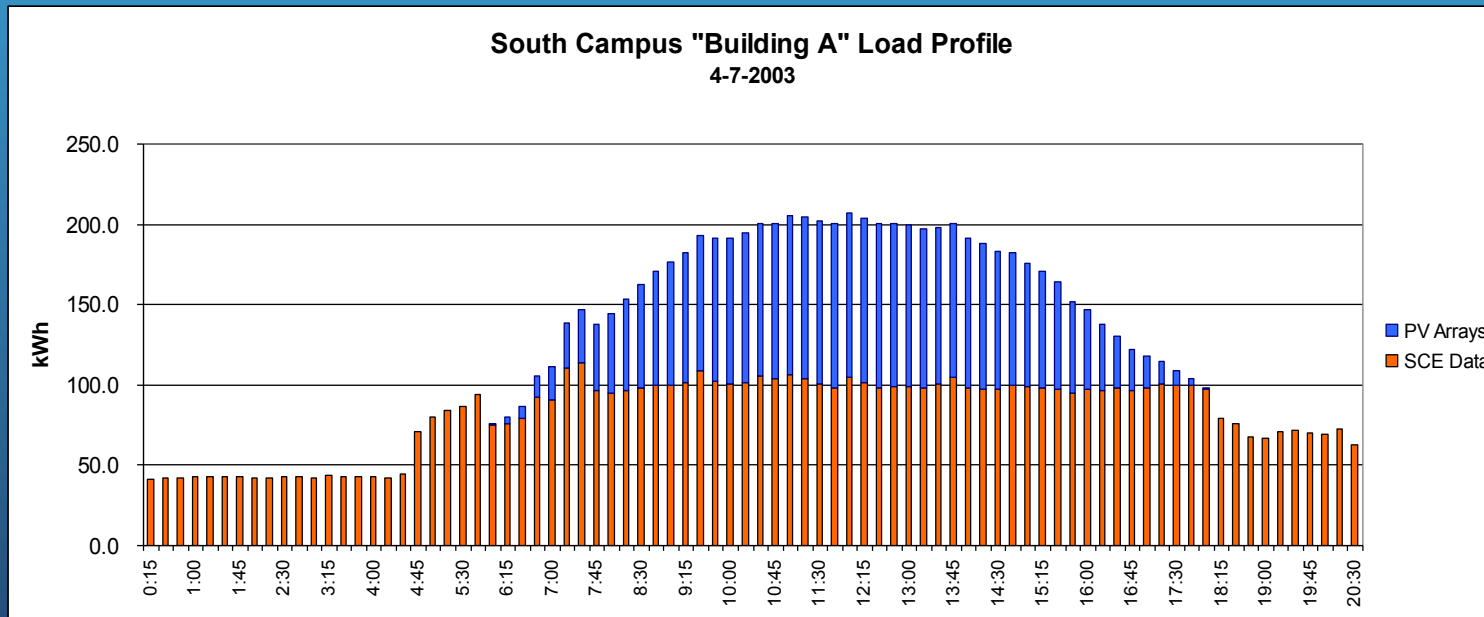




Load-Shedding Panels



Commissioning of Distributed Generation with other Electrical Systems is critical



Solar-fired Absorption Chiller Solar Collectors



Solar-Fired Absorption Chiller Mechanical Room



Cistern Installation - Traffic Delay Today





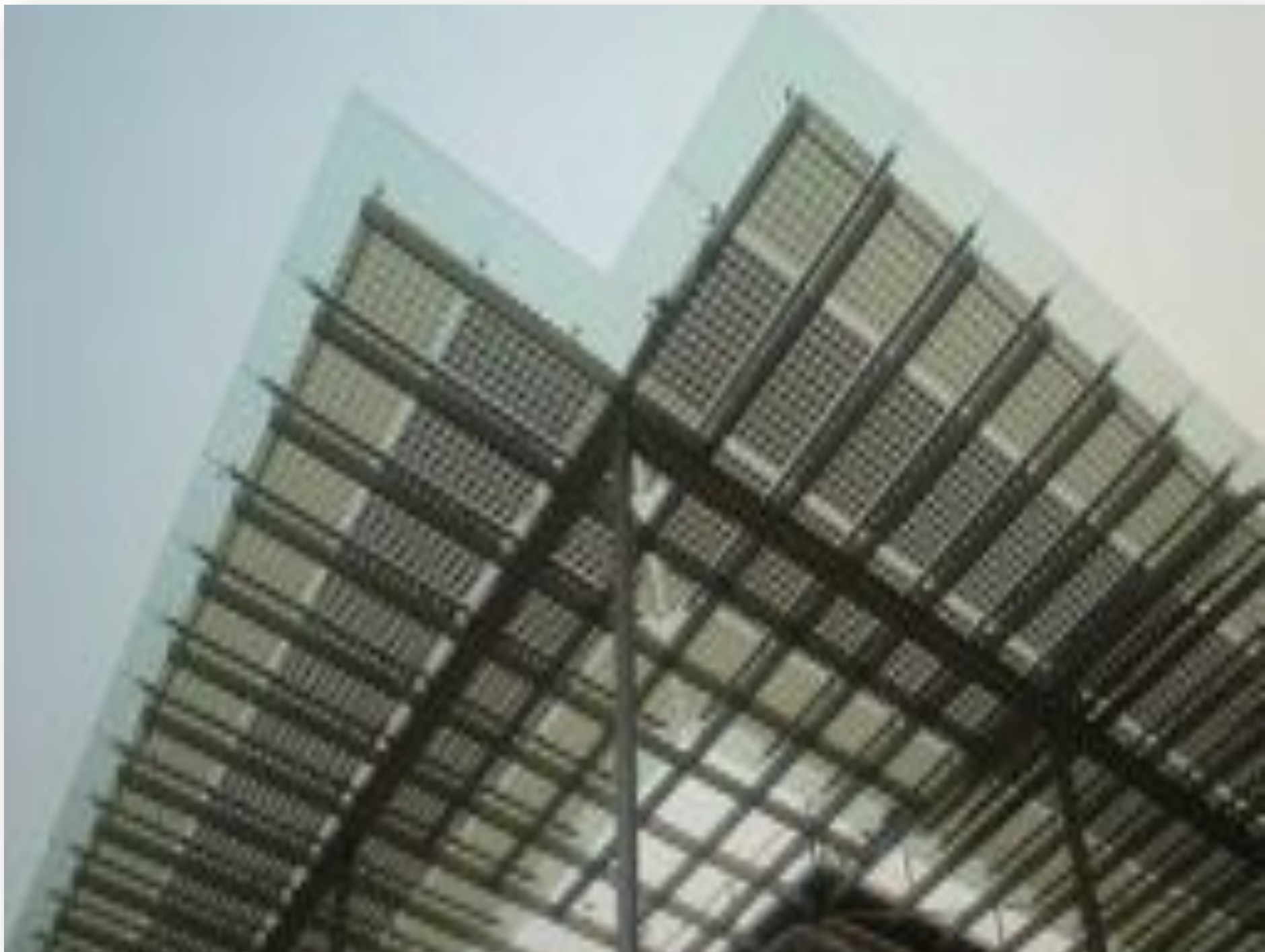
That was easy



**California Academy of Sciences
Golden Gate Park
San Francisco, CA**











Green Building Rating Systems

- USA

- Green Building Council Leadership in Energy & Environmental Design
- Collaborative for High Performance Schools
- Green Globes
- Living Buildings Challenge
- Other approaches

- International

- European Buildings Mandate
- Building Research Establishment Environmental Assessment Method (BREEAM)
- Hong Kong BREEAM
- Estidama
- Regional systems
- National systems
- Some use of LEED & others

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